



1  
00:00:06,630 --> 00:00:03,429  
this mission has quite a quite a history

2  
00:00:11,110 --> 00:00:06,640  
uh it was originally planned to launch

3  
00:00:13,430 --> 00:00:11,120  
about uh 2004 or five or so

4  
00:00:15,030 --> 00:00:13,440  
but then the columbia accident occurred

5  
00:00:17,029 --> 00:00:15,040  
and the administrator at the time

6  
00:00:18,630 --> 00:00:17,039  
decided that this would not be

7  
00:00:20,550 --> 00:00:18,640  
a safe thing to do

8  
00:00:23,029 --> 00:00:20,560  
because what most people don't realize

9  
00:00:24,870 --> 00:00:23,039  
is every time the shuttle launches it

10  
00:00:27,109 --> 00:00:24,880  
goes someplace now it goes to the space

11  
00:00:28,230 --> 00:00:27,119  
station it's a different inclination of

12  
00:00:30,230 --> 00:00:28,240  
orbit

13  
00:00:31,509 --> 00:00:30,240

to go to hubble you go to a different

14

00:00:33,270 --> 00:00:31,519

orbit

15

00:00:34,870 --> 00:00:33,280

and if something goes badly on this

16

00:00:36,870 --> 00:00:34,880

mission you cannot get to the space

17

00:00:41,750 --> 00:00:36,880

station there's no

18

00:00:45,270 --> 00:00:43,430

the shuttle people to their credit found

19

00:00:47,350 --> 00:00:45,280

a way to make this a safer mission and

20

00:00:49,830 --> 00:00:47,360

that is the way you do that is have a

21

00:00:52,630 --> 00:00:49,840

second space shuttle on the launch pad

22

00:00:54,150 --> 00:00:52,640

ready to go and rescue the astronauts if

23

00:00:56,069 --> 00:00:54,160

it's determined that there was a problem

24

00:00:57,510 --> 00:00:56,079

with the first orbiter some debris hit

25

00:00:58,549 --> 00:00:57,520

or something that would

26

00:01:00,549 --> 00:00:58,559

risk the

27

00:01:02,790 --> 00:01:00,559

their lives coming back in into the

28

00:01:07,109 --> 00:01:02,800

atmosphere so that's why you'll see two

29

00:01:12,070 --> 00:01:09,590

lyman spitzer dr lyman spitzer

30

00:01:14,070 --> 00:01:12,080

uh he's he's called the father of the

31

00:01:18,230 --> 00:01:14,080

hubble space telescope because he wrote

32

00:01:19,270 --> 00:01:18,240

a paper back in 1946 which was published

33

00:01:21,030 --> 00:01:19,280

uh he was working at the rand

34

00:01:22,550 --> 00:01:21,040

corporation at the time during the war

35

00:01:24,950 --> 00:01:22,560

just after the war

36

00:01:26,710 --> 00:01:24,960

and it was a paper looking at the german

37

00:01:28,550 --> 00:01:26,720

v2 rockets and saying you know with this

38

00:01:30,550 --> 00:01:28,560

capability of launching things into

39

00:01:32,310 --> 00:01:30,560

space wouldn't it be great to launch a

40

00:01:33,670 --> 00:01:32,320

telescope into space and get it above

41

00:01:35,830 --> 00:01:33,680

the atmosphere and not have the

42

00:01:40,390 --> 00:01:35,840

atmosphere mess up the images and be

43

00:01:42,389 --> 00:01:40,400

able to see ultraviolet and x-ray light

44

00:01:43,910 --> 00:01:42,399

i first got involved with hubble it was

45

00:01:46,910 --> 00:01:43,920

actually called the space telescope in

46

00:01:48,550 --> 00:01:46,920

those days back in

47

00:01:51,270 --> 00:01:48,560

1976

48

00:01:52,950 --> 00:01:51,280

when i uh took my first postgraduate job

49

00:01:55,270 --> 00:01:52,960

at princeton university and worked for

50

00:01:57,590 --> 00:01:55,280

lyman spitzer the father of hubble

51  
00:01:59,830 --> 00:01:57,600  
uh and i wasn't working on hubble in

52  
00:02:02,310 --> 00:01:59,840  
those days lyman spitzer was but i was

53  
00:02:05,190 --> 00:02:02,320  
involved in lunchtime conversations so i

54  
00:02:06,870 --> 00:02:05,200  
got sort of a dose of hubble from 76 to

55  
00:02:08,869 --> 00:02:06,880  
78.

56  
00:02:11,830 --> 00:02:08,879  
then i joined nasa headquarters in the

57  
00:02:14,470 --> 00:02:11,840  
astronomy program and shortly thereafter

58  
00:02:15,510 --> 00:02:14,480  
in 1979 i became the chief scientist on

59  
00:02:17,910 --> 00:02:15,520  
hubble

60  
00:02:19,750 --> 00:02:17,920  
and i filled that role basically from

61  
00:02:22,150 --> 00:02:19,760  
that point on until i started getting

62  
00:02:23,990 --> 00:02:22,160  
promoted but i've never been in a job

63  
00:02:26,790 --> 00:02:24,000

since then where hubble wasn't under my

64

00:02:29,589 --> 00:02:26,800

purview so to speak so i guess 31 years

65

00:02:30,790 --> 00:02:29,599

of direct purview and three years of

66

00:02:41,670 --> 00:02:30,800

of

67

00:02:44,869 --> 00:02:41,680

1990 and uh and i'm positive that if we

68

00:02:47,110 --> 00:02:44,879

all had written down the 100 most likely

69

00:02:48,550 --> 00:02:47,120

problems with the hubble space telescope

70

00:02:50,630 --> 00:02:48,560

if everybody involved with hubble had

71

00:02:53,350 --> 00:02:50,640

written down those top 100

72

00:02:55,430 --> 00:02:53,360

not one of them not one of them

73

00:02:56,710 --> 00:02:55,440

would have listed the mirrors the wrong

74

00:02:57,509 --> 00:02:56,720

shape

75

00:03:00,070 --> 00:02:57,519

so

76

00:03:02,309 --> 00:03:00,080

that that's not a positive story it's uh

77

00:03:04,630 --> 00:03:02,319

it's kind of a weird story but it's a

78

00:03:07,830 --> 00:03:04,640

true story

79

00:03:09,750 --> 00:03:07,840

and that led to the

80

00:03:13,509 --> 00:03:09,760

that led to three years of absolute hell

81

00:03:17,430 --> 00:03:15,509

hubble became

82

00:03:19,030 --> 00:03:17,440

it was in the press all the time with

83

00:03:20,710 --> 00:03:19,040

the problems it was a billion dollar

84

00:03:21,910 --> 00:03:20,720

mistake uh

85

00:03:23,750 --> 00:03:21,920

people in the press call it a

86

00:03:26,229 --> 00:03:23,760

technological disaster a national

87

00:03:28,710 --> 00:03:26,239

disgrace late night comedy hosts were

88

00:03:31,670 --> 00:03:28,720

making jokes about hubble cartoons would

89

00:03:34,149 --> 00:03:31,680

appear with mr magoo as true inventor of

90

00:03:39,270 --> 00:03:34,159

the hubble space telescope nobody really

91

00:03:43,030 --> 00:03:41,110

in the meantime the hubble team we

92

00:03:45,589 --> 00:03:43,040

worked quietly for three years we

93

00:03:46,789 --> 00:03:45,599

promised back in 1990 that we had a way

94

00:03:47,830 --> 00:03:46,799

to fix it

95

00:03:49,830 --> 00:03:47,840

uh

96

00:03:51,509 --> 00:03:49,840

and we put a new camera in with

97

00:03:54,070 --> 00:03:51,519

corrective optics in it that would cure

98

00:03:55,670 --> 00:03:54,080

the optical problem nobody believed us

99

00:03:58,309 --> 00:03:55,680

but we promised that we'd do it and

100

00:04:02,070 --> 00:03:58,319

would do it by december 93.

101  
00:04:04,229 --> 00:04:02,080  
and we launched the uh the mission sm-1

102  
00:04:05,429 --> 00:04:04,239  
on december 2nd i'll never forget that

103  
00:04:06,949 --> 00:04:05,439  
day

104  
00:04:11,750 --> 00:04:06,959  
1993

105  
00:04:13,429 --> 00:04:11,760  
and after five evas spacewalks

106  
00:04:15,429 --> 00:04:13,439  
the astronauts came home and about two

107  
00:04:17,909 --> 00:04:15,439  
weeks later we took off the bandages

108  
00:04:22,469 --> 00:04:17,919  
from our eyes and suddenly hubble was

109  
00:04:26,150 --> 00:04:24,390  
hubble you know we knew hubble was going

110  
00:04:28,629 --> 00:04:26,160  
to be important even before it was

111  
00:04:32,230 --> 00:04:28,639  
launched because it represented a factor

112  
00:04:35,270 --> 00:04:32,240  
of 10 10 times more power

113  
00:04:38,150 --> 00:04:35,280

to astronomical capability in terms of

114

00:04:40,150 --> 00:04:38,160

resolution how sharp the images in terms

115

00:04:41,990 --> 00:04:40,160

of how faint you could see

116

00:04:44,550 --> 00:04:42,000

than any current ground-based telescopes

117

00:04:46,150 --> 00:04:44,560

back in 1990. 10 times doesn't sound

118

00:04:49,510 --> 00:04:46,160

like a lot but it's a huge number in

119

00:04:52,790 --> 00:04:49,520

astronomy the last time we went a factor

120

00:04:55,110 --> 00:04:52,800

of 10 in capability to see the sky was

121

00:04:58,310 --> 00:04:55,120

all the way back in the 1600s when we

122

00:05:00,390 --> 00:04:58,320

went from the eye to galileo's telescope

123

00:05:02,150 --> 00:05:00,400

that represented a factor of 10 increase

124

00:05:04,790 --> 00:05:02,160

in capability

125

00:05:06,870 --> 00:05:04,800

well was that important well let's see

126  
00:05:08,629 --> 00:05:06,880  
before galileo we believe the earth was

127  
00:05:10,390 --> 00:05:08,639  
the center of the universe and

128  
00:05:12,230 --> 00:05:10,400  
everything rotated around the earth and

129  
00:05:14,070 --> 00:05:12,240  
nothing could go around any other object

130  
00:05:16,230 --> 00:05:14,080  
they all had to go around the earth

131  
00:05:18,390 --> 00:05:16,240  
uh galileo one of the first things

132  
00:05:19,830 --> 00:05:18,400  
galileo did was pointed his telescope at

133  
00:05:22,230 --> 00:05:19,840  
this bright light in the sky he didn't

134  
00:05:24,790 --> 00:05:22,240  
know it was jupiter but it was jupiter

135  
00:05:26,710 --> 00:05:24,800  
and he saw four dots and the next night

136  
00:05:28,150 --> 00:05:26,720  
he saw that they moved and then after

137  
00:05:30,310 --> 00:05:28,160  
night after night he saw that they went

138  
00:05:32,469 --> 00:05:30,320

around jupiter

139

00:05:33,830 --> 00:05:32,479

well this can't be this is not what our

140

00:05:35,510 --> 00:05:33,840

textbooks say

141

00:05:37,830 --> 00:05:35,520

it basically led ultimately to the

142

00:05:39,909 --> 00:05:37,840

copernican revolution the renaissance

143

00:05:42,230 --> 00:05:39,919

and the way we look at ourselves i mean

144

00:05:44,150 --> 00:05:42,240

it had profound effects on society the

145

00:05:47,029 --> 00:05:44,160

way humans looked at themselves it was a

146

00:05:51,270 --> 00:05:47,039

scientific a philosophical psychological

147

00:05:55,990 --> 00:05:53,749

we knew hubble would have some effect

148

00:05:59,430 --> 00:05:56,000

uh but nobody could have predicted

149

00:06:01,270 --> 00:05:59,440

it becoming an icon a world icon in

150

00:06:03,590 --> 00:06:01,280

terms of science

151

00:06:06,230 --> 00:06:03,600

in terms of education you can't pick up

152

00:06:08,390 --> 00:06:06,240

an astronomy textbook any place on earth

153

00:06:09,830 --> 00:06:08,400

i maintain if it's been published in the

154

00:06:11,270 --> 00:06:09,840

last 10 years

155

00:06:14,150 --> 00:06:11,280

it doesn't matter if it's published in

156

00:06:15,510 --> 00:06:14,160

arabic english spanish lithuanian or

157

00:06:17,350 --> 00:06:15,520

whatever

158

00:06:19,029 --> 00:06:17,360

i guarantee you that book will be filled

159

00:06:24,070 --> 00:06:19,039

with hubble images because they have

160

00:06:27,909 --> 00:06:26,230

in addition hubble's been adopted by the

161

00:06:30,150 --> 00:06:27,919

american people especially school

162

00:06:33,110 --> 00:06:30,160

children when when the final servicing

163

00:06:35,029 --> 00:06:33,120

mission was canceled a few years ago

164

00:06:37,029 --> 00:06:35,039

kindergarten kids grade school kids were

165

00:06:39,990 --> 00:06:37,039

writing in postcards saying please save

166

00:06:41,590 --> 00:06:40,000

the hubble save our telescope

167

00:06:43,110 --> 00:06:41,600

it's just become part of american

168

00:06:45,110 --> 00:06:43,120

society

169

00:06:46,550 --> 00:06:45,120

i maintain that the average the 300

170

00:06:48,550 --> 00:06:46,560

million americans

171

00:06:51,270 --> 00:06:48,560

if an america if the average american

172

00:06:52,390 --> 00:06:51,280

knows or has heard of one scientific

173

00:06:55,350 --> 00:06:52,400

project

174

00:06:56,950 --> 00:06:55,360

or instrument in their entire lives if

175

00:07:00,710 --> 00:06:56,960

it's only one i'll bet you that would be

176

00:07:04,629 --> 00:07:03,189

i've seen all of the uh hubble hubble

177

00:07:06,070 --> 00:07:04,639

launches i've seen a lot of shuttle

178

00:07:08,629 --> 00:07:06,080

launches but the hubble launches of

179

00:07:10,950 --> 00:07:08,639

course are special

180

00:07:12,469 --> 00:07:10,960

knowing that this is the last one

181

00:07:14,629 --> 00:07:12,479

knowing that i've spent an entire

182

00:07:17,430 --> 00:07:14,639

lifetime on this

183

00:07:21,110 --> 00:07:17,440

uh it'll be a lot of nostalgia

184

00:07:22,629 --> 00:07:21,120

but i i won't feel any pain because uh

185

00:07:24,790 --> 00:07:22,639

there are many things that people can

186

00:07:25,749 --> 00:07:24,800

work on in their careers

187

00:07:30,390 --> 00:07:25,759

uh

188

00:07:33,110 --> 00:07:30,400

fields i could have been an engineer and

189

00:07:33,909 --> 00:07:33,120

maybe maybe my contribution to society

190

00:07:35,909 --> 00:07:33,919

is

191

00:07:37,589 --> 00:07:35,919

i could have designed the first cell

192

00:07:38,870 --> 00:07:37,599

cell phone that broke the three ounce

193

00:07:42,230 --> 00:07:38,880

barrier

194

00:07:44,550 --> 00:07:42,240

you know and only weighed 2.95 ounces

195

00:07:45,909 --> 00:07:44,560

in a hundred years from now maybe my

196

00:07:48,550 --> 00:07:45,919

grandchildren would consider that a

197

00:07:50,390 --> 00:07:48,560

major breakthrough

198

00:07:51,670 --> 00:07:50,400

i have a feeling 100 years from now

199

00:07:52,950 --> 00:07:51,680

hubble's still going to be in the

200

00:07:54,790 --> 00:07:52,960

history books

201  
00:07:56,629 --> 00:07:54,800  
and knowing their granddad

202  
00:07:58,390 --> 00:07:56,639  
worked on hubble and was heavily

203  
00:08:00,950 --> 00:07:58,400  
involved in it i think

204  
00:08:03,350 --> 00:08:00,960  
leaves a legacy that i'm kind of proud

205  
00:08:04,790 --> 00:08:03,360  
proud of

206  
00:08:06,469 --> 00:08:04,800  
t-minus six

207  
00:08:07,430 --> 00:08:06,479  
five four

208  
00:08:08,390 --> 00:08:07,440  
three

209  
00:08:09,189 --> 00:08:08,400  
two

210  
00:08:11,189 --> 00:08:09,199  
one

211  
00:08:13,029 --> 00:08:11,199  
and liftoff of the space shuttle

212  
00:08:17,990 --> 00:08:13,039  
discovery with the hubble space

213  
00:08:23,510 --> 00:08:21,110

mission control houston

214

00:08:38,389 --> 00:08:23,520

overall program

215

00:08:38,399 --> 00:08:50,790

looks good

216

00:08:56,790 --> 00:08:52,949

and as the crew just confirmed we're

217

00:08:58,949 --> 00:08:56,800

seeing both blankets beginning to unfurl

218

00:09:03,829 --> 00:08:58,959

on the port side solar

219

00:09:03,839 --> 00:09:20,949

so far we see

220

00:09:24,150 --> 00:09:22,389

to go ahead and

221

00:09:26,710 --> 00:09:24,160

do rms fire down so we get the guys out

222

00:09:29,110 --> 00:09:26,720

there like that

223

00:09:31,190 --> 00:09:29,120

but that's at your convenience team

224

00:09:34,829 --> 00:09:31,200

but once we do have the rms stowed then

225

00:09:37,430 --> 00:09:36,150

okay um

226

00:09:38,630 --> 00:09:37,440

i'll tell you what we'll spend just a